AMENDMENTS TO THE CLAIMS:

Please amend the remaining claims as set forth below.

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (currently amended): A brushless DC motor comprising

an armature assembly; and

a field assembly, including

a plurality of permanent magnets each having a length;

first and second end magnets each having a length; and

a plurality of pole pieces each having a length; and

wherein the length of the first and second end magnets is less than the length of the plurality of pole pieces and the length of the plurality of permanent magnets, and further wherein the ratios ~~ratio~~ between the length of the plurality of permanent magnets, the length of the first and second end magnets, and the length of the plurality of pole pieces are ~~is~~ tailored to achieve a constant force versus stroke characteristic with sinusoidal commutation.

Claim 2 (currently amended): A brushless DC motor comprising

an armature assembly; and

a field assembly positioned with respect to the armature assembly so that an air gap is formed between them, including

a plurality of permanent magnets each having a length;

first and second end magnets each having a length; and

a plurality of pole pieces each having a length; and

wherein the length of the first and second end magnets is less than the length of the plurality of pole pieces and the length of the plurality of permanent magnets, and further wherein the ratios ~~ratio~~ between the length of the plurality of permanent magnets, the length of the first and second end magnets, and the

length of the plurality of pole pieces is selected to provide a sinusoidal distribution of a normal component of flux density in the air gap.

Claim 3 (original): The brushless DC motor of claims 1 or 2, further including

a housing comprising magnetic material; and

end caps including end pole pieces having a length, and positioned on the field assembly so that the field assembly, the end caps and the housing form a common magnetic circuit; and

wherein the ratio of the length of the end pole pieces to the length of the plurality of pole pieces is selected so that a sinusoidal force versus entire stroke characteristic is obtained for the brushless DC motor.

Claim 4 (original): The brushless DC motor of claims 1 or 2 wherein the plurality of permanent magnets and the plurality of pole pieces are positioned along a common field assembly axis, and so that each of the plurality of permanent magnets is separated from another by different ones of the plurality of pole pieces.

Claim 5 (currently amended): A brushless DC motor comprising

an armature assembly;

a field assembly, including

a plurality of permanent magnets each having a length; and

a plurality of pole pieces each having a length;

a housing comprising magnetic material; and

end caps including end pole pieces having a length, and positioned on the field assembly so that the field assembly, the end caps and the housing form a common magnetic circuit; and

wherein the ratio between the length of the plurality of permanent magnets and the length of the plurality of pole pieces is tailored to achieve a constant force versus stroke characteristic, wherein the ratio of the length of the end pole pieces to the length of the plurality of pole pieces is selected so that a sinusoidal force versus entire stroke characteristic is obtained for the brushless DC motor, and ~~The brushless DC motor of~~

~~claim 3~~ wherein the length of each of the plurality of pole pieces is two-thirds (2/3) the length of each of the plurality of permanent magnets.

Claim 6 (currently amended): A brushless DC motor comprising

an armature assembly;

a field assembly, including

a plurality of permanent magnets each having a length; and

a plurality of pole pieces each having a length;

wherein the plurality of permanent magnets and the plurality of pole pieces are positioned along a common field assembly axis, and so that each of the plurality of permanent magnets is separated from another by different ones of the plurality of pole pieces, and

wherein the ratio between the length of the plurality of permanent magnets and the length of the plurality of pole pieces is tailored to achieve a constant force versus stroke characteristic, and further ~~The brushless DC motor of claim 4~~ wherein the length of each of the plurality of pole pieces is two-thirds (2/3) the length of each of the plurality of permanent magnets.

Claim 7 (original): The brushless DC motor of claim 3 wherein the length of each of the end pole pieces is one half (1/2) the length of each of the plurality of pole pieces.

Claim 8 (currently amended): The brushless DC motor of claim 4, further including

a housing comprising magnetic material; and

end caps including end pole pieces having a length, and positioned on the field assembly so that the field assembly, the end caps and the housing form a common magnetic circuit, and wherein the length of each of the end pole pieces is one half (1/2) the length of each of the plurality of pole pieces.

Claim 9 (original): The brushless DC motor of claim 5 wherein the length of each of the end pole pieces is one half (1/2) the length of each of the plurality of pole pieces.

Claim 10 (currently amended): The brushless DC motor of claim 6, further including

a housing comprising magnetic material; and

end caps including end pole pieces having a length, and positioned on the field assembly so that the field assembly, the end caps and the housing form a common magnetic circuit, and wherein the length of each of the end pole pieces is one half (1/2) the length of each of the plurality of pole pieces.

Claim 11 (original): The brushless DC motor of claims 1 or 2 wherein the armature assembly includes a non-magnetic coil base, and a plurality of coils supported on the non-magnetic coil base.

Claim 12 (original): The brushless DC motor of claim 11 wherein the plurality of coils form a three (3) phase winding.

Claim 13 (currently amended): A linear motion device, comprising

a field assembly, including

a plurality of pole pieces;

a plurality of end pole pieces; ~~and~~

a plurality of permanent magnets;

first and second end magnets; and

wherein the plurality of pole pieces, the plurality of end pole pieces, and the plurality of permanent magnets are positioned along a common axis so that ones of the plurality of pole pieces are positioned between ones of the plurality of permanent magnets;

a housing positioned about the field assembly to form a common magnetic circuit with the field assembly;

an armature assembly adapted to travel along the common axis, and positioned between the housing and the field assembly to define a gap between the armature assembly and the field assembly, the armature assembly including

a non-magnetic coil base;

a plurality of coils supported on the non-magnetic coil base; and

further wherein each of the plurality of permanent magnets has a length and polarity and each of the plurality of pole pieces has a length and the plurality of end pole pieces has a length, and the first and second end magnets each has a length which is less than the length of the plurality of magnets and the length of the plurality of pole pieces, all of which are selected so that the field assembly provides a constant force versus stoke characteristic and a sinusoidal distribution of a normal component of the flux density in the gap.

14 (currently amended): A linear motion device, comprising

a field assembly, including

a plurality of pole pieces;

a plurality of end pole pieces; and

a plurality of permanent magnets;

wherein the plurality of pole pieces, the plurality of end pole pieces, and the plurality of permanent magnets are positioned along a common axis so that ones of the plurality of pole pieces are positioned between ones of the plurality of permanent magnets;

a housing positioned about the field assembly to form a common magnetic circuit with the field assembly;

an armature assembly adapted to travel along the common axis, and positioned between the housing and the field assembly to define a gap between the armature assembly and the field assembly, the armature assembly including

a non-magnetic coil base;

a plurality of coils supported on the non-magnetic coil base; and

further wherein each of the plurality of permanent magnets has a length and polarity and each of the plurality of pole pieces and plurality of end pole pieces has a length which are selected so that the field assembly provides a constant force versus stoke characteristic and a sinusoidal distribution of a normal component of the flux density in the gap ~~The linear motion device of claim 13~~, wherein the length of each of the plurality of pole pieces is two-thirds (2/3) the length of each of the plurality of permanent magnets.

Claim 15 (original): The linear motion device of claim 13 wherein the length of each of the end pole pieces is one half (1/2) the length of each of the plurality of pole pieces.

Claim 16 (currently amended): A method of forming a brushless DC motor having an armature assembly and a field assembly, comprising the steps of

positioning a plurality of permanent magnets each having a length, and first and second end magnets each having a length, along a common field assembly axis;

positioning a plurality of pole pieces each having a length along the common field assembly axis, and so that ones of the plurality of pole pieces alternate with ones of the plurality of permanent magnets; and

selecting ratios ~~the ratio~~ between the length of the plurality of permanent magnets, the lengths of the first and second end magnets, and the length of the plurality of pole pieces to achieve a sinusoidal force versus stroke characteristic, when only one phase or a combination of two phases of the armature are energized, wherein the lengths of the first and second end magnets are less than the length of the plurality of permanent magnets, and less then the length of the plurality of pole pieces.

Claim 17 (original): The method of claim 16, further including the step of positioning the field assembly with respect to the armature assembly so that an air gap is formed between them, and further wherein the selecting step includes

setting the ratio between the length of the plurality of permanent magnets and the length of the plurality of pole pieces to provide a sinusoidal distribution of a normal component of flux density in the air gap.

Claim 18 (original): The method of claims 16 or 17, further including the steps of

providing a housing formed of magnetic material;

providing end caps including end pole pieces having a length, and

positioning the housing and the end caps and the field assembly so that the field assembly, the end caps and the housing form a common magnetic circuit; and

adjusting the ratio of the length of the end pole pieces to the length of the plurality of pole pieces so that a sinusoidal force versus entire stroke characteristic is obtained for the brushless DC motor.

Claim 19 (original): The method of claims 16 or 17 wherein the selecting step includes the step of setting the length of each of the plurality of pole pieces to be two-thirds (2/3) the length of each of the plurality of permanent magnets.

Claim 20 (original): The method of claim 18 wherein the adjusting step includes the step of setting the length of each of the plurality of pole pieces to be two-thirds (2/3) the length of each of the plurality of permanent magnets.

Claim 21 (original): The method of claim 18 wherein the adjusting step includes the step of setting the length of each of the end pole pieces to be one half (1/2) the length of each of the plurality of pole pieces.

Claim 22 (original): The method of claims 16 or 17 further including the step of forming the armature assembly of a non-magnetic coil base, and a plurality of coils supported on the non-magnetic coil base.

Claim 23 (original): The method of claim 22 wherein the step of forming the armature assembly step includes the step of forming a three (3) phase winding from the plurality of coils.

Claim 24 (currently amended): A method of forming a linear motion device, comprising the steps of

forming a field assembly of a plurality of pole pieces~~,~~ a plurality of end pole pieces~~,~~ and a plurality of permanent magnets, and first and second end magnets;

positioning the plurality of pole pieces, the plurality of end pole pieces, the first and second end magnets, and the plurality of permanent magnets along a common axis so that ones of the plurality of pole pieces are positioned between ones of the plurality of permanent magnets, and the first end magnet followed by one of the plurality of end pole pieces is positioned at one end, and the second end magnet followed by another of the plurality of end pole pieces is positioned at an opposite end;

positioning a housing about the field assembly to form a common magnetic circuit with the field assembly;

supporting a plurality of coils supported on a non-magnetic coil base to form an armature assembly;

positioning the armature assembly to be adapted to travel along the common axis between the housing and the field assembly and to define a gap between the armature assembly and the field assembly, and

selecting a length and polarity of each of the plurality of permanent magnets, a length and polarity of the first and second end magnets, a length and polarity of each of the plurality of pole pieces, and length and polarity of each of the plurality of end pole pieces, wherein the length of the first and second end magnets is less than the length of the plurality of permanent magnets and the length of the plurality of pole pieces, so that the field assembly provides a constant force versus stoke characteristic and a sinusoidal distribution of a normal component of the flux density in the gap.

Claim 25 (original): The method of claim 24, wherein the selecting step includes the step of setting the length of each of the plurality of pole pieces to be two-thirds (2/3) the length of each of the plurality of permanent magnets.

Claim 26 (original): The method of claim 24, wherein the selecting step includes the step of setting the length of each of the end pole pieces to be one half (1/2) the length of each of the plurality of pole pieces.

Claim 27 (new): A brushless DC motor comprising

an armature assembly; and

a field assembly positioned with respect to the armature assembly so that an air gap is formed between them, including

a plurality of permanent magnets each having a length; and

a plurality of pole pieces each having a length;

a housing comprising magnetic material; and

end caps including end pole pieces having a length, and positioned on the field assembly so that the field assembly, the end caps, and the housing form a common magnetic circuit; and

wherein the ratio between the length of the plurality of permanent magnets and the length of the plurality of pole pieces is selected to provide a sinusoidal distribution of a normal component of flux density in the air gap, and

wherein the length of each of the plurality of pole pieces is two-thirds (2/3) the length of each of the plurality of permanent magnets.

Claim 28 (new): The brushless DC motor of claim 27, wherein the length of each of the end pole pieces is one half (1/2) the length of each of the plurality of pole pieces.

Claim 29 (new): A brushless DC motor comprising

an armature assembly; and

a field assembly positioned with respect to the armature assembly so that an air gap is formed between them, including

a plurality of permanent magnets each having a length; and

a plurality of pole pieces each having a length; wherein the plurality of permanent magnets and the plurality of pole pieces are positioned along a common field assembly axis, and so that each of the plurality of permanent

magnets is separated from another by different ones of the plurality of pole pieces; and

wherein the ratio between the length of the plurality of permanent magnets and the length of the plurality of pole pieces is selected to provide a sinusoidal distribution of a normal component of flux density in the air gap; and

wherein the length of each of the plurality of pole pieces is two-thirds (2/3) the length of each of the plurality of permanent magnets.

Claim 30 (new): The brushless DC motor of claim 29, further including

a housing comprising magnetic material; and

end caps including end pole pieces having a length, and positioned on the field assembly so that the field assembly, the end caps and the housing form a common magnetic circuit, and wherein the length of each of the end pole pieces is one half (1/2) the length of each of the plurality of pole pieces.